CMORE BioLINCS cruise 6-21st Sept 2011
Draft cruise plan

Cruise ID: KM11-25
Vessel: R/V *Kilo Moana*, University of Hawaii
Master of the Vessel: Captain Gray Drewry
Chief Scientist: Julie Robidart, MBARI/UCSC
OTG Marine Technicians: Kuhio Vellalos, Trevor Goodman

Shipping address:
Blake Watkins,
C-MORE Sept BioLINCS cruise, KM11-25
C/O UH Marine Center
#1 Sand Island Access Road
Honolulu, HI 96819

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Marine Center phone number: *842-9813*
Julie Robidart cell number: *619-884-7443*
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Loading: Sept 6, 2011 @ 0800
Departure: Sept 6, 2011 @ 0900
Arrival: Sept 21, 2011 @ 0900

1.0 SCIENTIFIC AIM

Examine microbial biogeochemical cycling and diel periodicity in the surface seawater and lower euphotic zone in the North Pacific Subtropical Gyre (NPSG). This scientific research will be coordinated with the field testing of instruments and sensors for the autonomous genomic and metabolic measurements.

Prior to the cruise we will be monitoring the NPSG using satellite observations and SeaGliders, particularly in the vicinity of Stn ALOHA (22°45'N, 158°W with 6 nm radius), to determine formation of any eddies and any increase in plankton biomass. We envisage deploying the instruments and sensors in an eddy within 100km of Stn ALOHA. Following the deployments, the ship will stay within approximately 100 km of the instruments for the remainder of the cruise.

It must be noted that at Stn ALOHA there are two existing navigational hazards, known as the WHOTS mooring located at 22°40' N, 157°57'W and the ALOHA observatory located at 22°44' N, 158°0.3'W. These moorings are to be avoided by all seagliders, deployed equipment, and ship operations *e.g.* acoustic interference. Their location, in relation to Stn ALOHA, is provided on the last page of the cruise plan.

1.1 SCIENTIFIC OBJECTIVES

1. Deploy the Environmental Sample Processor to: a) examine spatiotemporal dynamics in nifH within eddies and fronts; b) collect archive samples over a 48-36 hour period for metatranscriptomic analyses within a homogeneous water mass; c) archive samples for downstream molecular analysis

2. Deploy the 4L Submersible Incubation Device (4L-SID) for combined *in situ* ^{13}C-Primary Production (PP) & ^{15}N-N_2 fixation rate measurements over a ~5 day period. Compliment the SID measurements with vertical profiles of N_2 fixation using the *in situ* gas array. In addition conduct shipboard incubation measurements for rates of H_2 production and N_2 fixation using acetylene reduction assay.

3. Deploy two Incubation Productivity Systems (IPS) at two depths for combined *in situ* ^{13}C-PP & ^{15}N-nitrification rate measurements over a ~5 day period.

4. Deploy a drifting sediment trap with high vertical resolution between 150 and 450 m, traps every 20 m

5. Measure high vertical resolution profiles of nutrients (NO3, NO2, NH4) between 100 and 200 m. At these depths, we will also measure the rates of nitrification and characterize specific archaeal microbial processes. Finally we will also analyze single cells using flow cytometry from these depths to look at changes in morphology and pigment ratios.

6. Analyze Archaeal lipids at 4 discrete depths (euphotic zone and upper mesopelagic) in the water column

7. Perform shipboard incubations to complement ESP operations:
   - Diel transcriptomics: light- vs. dark-incubations for 48 hours
   - "Simulated frontal zone" incubations for 48 hours

1.2 SCIENTIFIC OPERATIONS

Equipment to be deployed: ESP, ISP, SID, Sediment traps, gas array, CTD operations,

Underway/continuous: ADCP, thermosalinograph, fluorometry, pCO2 system

2.0 SCIENTIFIC PERSONNEL

Participant	**Title**	**Affiliation**
Peter Alpert (M)	Research Associate	Stony Brook
Jessica Bryant (F)	Graduate student	MIT
Deniz Bombar (M)	Post-Doc	UCSC
Tara Clemente (F)	Research Associate	UH/CMORE
Daniela del Valle (F)	Post-doc	UH/CMORE

Ken Doggett (M)	Research Associate	UH/CMORE
Kim Fulton-Bennett (M)	Communications Associate	MBARI
Sara Lincoln (F)	Graduate student	MIT
Roman Marin (M)	Marine Engineer	MBARI
Gene Massion (M)	Marine Engineer	MBARI
Elizabeth Ottesen (F)	Post-Doc	MIT
Ariel Rabines (M)	Research Assistant	UCSC
Julie Robidart (F)	Chief Scientist	MBARI/UCSC
Ben Ruben (M)	Intern	UH/CMORE
Mariona Segura (F)	Post-Doc	UH/CMORE
Craig Taylor (M)	Scientist	WHOI
Kendra Turk (F)	Specialist	UCSC
Ger van den Engh (M)	Scientist	UH/CMORE
John Waterbury (M)	Scientist	WHOI
Blake Watkins(M)	Marine Engineer	UH/CMORE
Sam Wilson (M)	Post-Doc	UH/CMORE
Kuhio Vellalos (M)	Marine Technician	OTG
Trevor Goodman (M)	Marine Technician	OTG

(Science personnel equals 21 out of a possible 26 science berths)

3.0 OPERATIONAL PLANS

3.05 Transit to the first station, north of the Hawaiian Islands, within 100 km of Station ALOHA (22°45'N, 158°W with 6 nm radius)

3.1 Water column measurements.

Vertical profiles of temperature, conductivity and dissolved oxygen will be made with an instrument package consisting of a Sea-Bird CTD attached to a 24-place rosette with 12 liter sampling bottles. We will need the ship's CTD winch and crane for these operations. Water samples for biogeochemical measurements will also be collected on each cast.

3.2 Environmental Sample Processor

The Environmental Sample Processor (ESP) provides in situ collection and analysis of water samples from the subsurface ocean. The instrument is an electromechanical, fluidics system designed to collect discrete water samples, concentrate microorganisms or particles, and automate application of molecular probes in order to identify microorganisms and their gene products. Data generated are then available for remote retrieval and analysis in near real-time. The instrument will be configured to detect UCYN-A, UCYN-B, Heterocystous cyanobacteria group 1, *Trichodesmium*, and γ-proteobacterial nitrogenase gene abundances once or twice daily. The two objectives of this deployment (diel transcriptomics and spatiotemporal detection of microbial population changes) require contrasting conditions (a homogeneous water mass vs. water mass transition/frontal zones), so the aim is to deploy the instrument in a homogeneous water mass, where it remains for several (2-4) days, then transitions to a frontal

zone (1-3 days), and ideally to another homogeneous water mass at the end of the deployment. The instrument will have GPS, a nav light and RF beacon. We will be communicating with the instrument via Iridium link and a 900 MHz radio modem (frequency can be changed if used by a concurrently-deployed instrument). Instrument will be deployed once for a 12-day period. Instrument can be towed and/or recovered if unforeseen circumstances require so.

3.3 Incubation Productivity System (IPS)

The Incubation Productivity System (IPS) is an instrument that conducts time series *in situ* tracer incubations in 400 ml samples and if desired can collect/preserve particulate or water samples for subsequent analysis. Two IPS machines will each conduct combined ^{13}C- PP and ^{15}N-NH_4 oxidation to ^{15}N-NO_3 measurements (up to 12 end point incubations; exact implementation yet to be determined). The ^{13}C-particulate samples will be collected and chemically preserved via specialized Fixation Filter Units (FFU) and ^{15}N-containing filtrates will be collected in metalized polyethylene bags (polyethylene-aluminum-polyethylene laminate) that each contain a preservative. The two machines will be deployed at two different depths on a free drifting spar float system. The location of the array will be monitored via two Iridium GPS transponders. The IPS & 4L-SID instruments will be deployed/recovered on the array at most twice during the cruise, with an approximately 24 hr "recycling" period required to process samples and reconfigure the machines.

3.4 Submersible Incubation Device (SID)

The 4L Submersible Incubation Device (4L-SID) is also an instrument that conducts time series *in situ* tracer incubations in 4000 ml samples and if desired can collect/preserve particulate or water samples for subsequent for subsequent analysis. This instrument will conduct combined *in situ* ^{13}C-PP & ^{15}N-N_2 fixation measurements (up to 5-24 hr incubations). Samples will be collected & chemically preserved in FFUs. Implementing a new prototype FFU (2 available) particulate samples (2) will be taken at chosen times and v. quickly preserved in RNAlater for subsequent phylogenetic & gene function analyses. The 4L-SID will be deployed at a chosen depth along with the two IPS units. The IPS & 4L-SID instruments will be deployed/recovered on the array at most twice during the cruise, with an approximately 24 hr "recycling" period required to process samples and reconfigure the machines.

3.5 Gas array

A free drifting incubation array will be deployed the third day of the cruise at Station ALOHA. Samples for the gas array will be collected from a CTD cast beforehand. We request the use of the A-frame for this operation and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s *TBD*), emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), a strobe light and a radio transmitter (channel *TBD*). The ship will not need to keep within sight of the array until the time of the recovery,

approximately 24 hours after its deployment. Assistance from the Bridge is requested in plotting the drift track of the array.

3.6 Sediment trap array deployment

The floating sediment traps will be deployed 24 h after the ESP deployment. The exact location will be determined beforehand by local current conditions. The array will be deployed from the stern, using the A-frame and Sea-Mac winch. Power requirement for the winch is 440 VAC, three phase at 10 amps. After deployment we request that the Bridge verify that the radio transmitters are functioning and directionally correct.

The array will drift for about 8 days before recovery. The array is equipped with 2 ARGOS satellite transmitters (platform #'s *TBD*), 2 strobe lights, and 2 radio transmitters (channel *TBD* see ESP section*). Daily positions of the array shall be transmitted by email directly to the ship (argosfix@km.soest.hawaii.edu, password: argosfix), therefore the ship will **not** need to keep within site of the array until the time of the recovery. Assistance from the Bridge is requested in plotting the drift track of the array. We request the use of the ship's radio direction finder for locating the array before recovery.

3.7 Primary productivity in situ array

The in situ array will be deployed from the stern in two occasions, currently planned for 8th and 15th September. Prior to the deployment of the array, seawater samples will be collected using the CTD-rosette. For the deployment of the array, we request the use of the A-frame and will also use the Sea-Mac winch. The array is equipped with two ARGOS satellite transmitters (platform #'s 60484, 84857, emailing positions to argosfix@km.soest.hawaii.edu, password: argosfix), strobe lights and a radio transmitter (channel 74, 156.725 MHz). The array will be recovered 24 h after deployment. The array will hold closed HDPE bottles which will be used to obtain nitrification rates using three different approaches: (1) 15N-uptake, (2) low-level chemical assays and (3) inhibitor-sensitive radiocarbon uptake experiments. All radioactive waste generated by the experiment shall be returned to the University of Hawaii. Only qualified personnel shall handle radioactive material

3.8 McLane pumps

Deploy two McLane Large Volume Water Transfer System (WTS-LV) for a period of 4 hours on every operation. The pumps filter large volumes of water *in situ* through a 142 mm filter and are battery powered. We request the use of the A-frame, the Sea-Mac winch and also ¼ diameter line. The pumps are clamped onto the wire at selected depths within the upper 1000 m.

3.9 Radioisotope operations

Measurements will be made of nitrification rates using dark incorporation of ^{14}C-HCO_3- into particulate organic matter and H_2 consumption rates by measuring the conversion of ^{3}H-H_2 into ^{3}H-H_2O. Samples will be incubated on deck in closed containers, and all processing will be carried exclusively in the radioisotope van.

Daily swipes will be conducted in compliance with conditions imposed by the Radiation Safety Office and OTG. All radioactive waste generated during the cruise will be returned to the University of Hawaii. Only qualified personnel shall handle radioactive material.

3.10 Acoustic Doppler Current Profiler

The ship's acoustic Doppler current profiler (ADCP) will be in operation during the duration of the cruise. The OTG electronics technician will be in charge of the ADCP system.

3.11 Thermosalinograph and Fluorometer

The ship's thermosalinograph and fluorometer sampling the uncontaminated seawater supply system will be in operation during the duration of the cruise while the ship is outside of Snug harbor. The OTG technicians will be in charge of the thermosalinograph and fluorometer operations.

4.0 EQUIPMENT

4.1 The HOT science party shall be bringing the following

1. Two 20 ft. laboratory vans with assorted equipment for radioisotope and general use (Flow cytometer van and OTG rad van)
2. One 10 ft. equipment van ("White" Van)
3. Distilled, deionized water and all required chemicals and isotopes
4. Large vacuum waste container
5. Liquid nitrogen dewars
6. Drifting ESP
7. Drifting SID and ISP
8. Drifting sediment trap array with strobe lights, satellite and radio transmitters, floats, weights
9. Sediment traps and crosses
10. Drifting gas array with light and radio transmitter, floats, weights, polypro. line, spare buoy, etc.
11. Hyperpro
12. Oxygen titration system
13. Plankton nets and towing lines
14. Desktop and laptop personal computers
15. Assorted tools
16. All required sampling bottles
17. Deck incubation system
18. Two copies of pertinent MSDS

4.2 We will need the use of the following ship's equipment:

1. Seabird CTD system, all sensors plus spares, deck boxes and computer CTD acquisition systems
2. Rosette and 24 12L Bullister sampling bottles, and all associated spare parts
3. A-frame and A-frame block assembly

4. Electric power for winches (440 VAC, 3 phase, 60 Amp breaker) and vans (208 VAC single phase at 60 amps for lab van, 110 VAC 10 amps for equipment van)
5. Radio direction finder
6. Space on the main deck for one equipment van
7. Space on upper deck for two laboratory vans
8. Space on upper deck for incubators
9. Hand-held VHF transceivers
10. Precision depth recorder
11. Shackles, sheaves, hooks and lines
12. Shipboard Acoustic Doppler Current Profiler
13. Thermosalinograph, pCO2 system, and Fluorometer
14. Meteorological suite
15. Copy machine
16. Grappling hooks and line
17. Laptop with Nobeltec charting software and GPS feed
18. Running fresh water and seawater hoses
19. Electronic mail system
20. GPS system
21. Uncontaminated seawater supply
22. Small capstan (~ 10 m/min)
23. Underway/on-station data acquisition system for meteorological instruments, ADCP, thermosalinograph, fluorometer, pCO2 and access to real-time data through the network. 25. OTG's 24-place rosette, and 24 12-l water sampling bottles (to be used as spare)
24. 1000 lb weight.
25. Large Sea-Mac winch (Mod. 1025 EHS) 60 Amp Hubbel plug/connector (440 VAC, 3 phase, 60 Amp breaker)
26. Lifting basket to transport carboys from the main deck to the 02 deck

Ship: R/V *KILO MOANA* KM11-26 Date: Sept6-21, 2011

TIME	Tues. 9/6	Wed. 9/7	Thurs. 9/8	Fri. 9/9	Sat. 9/10
0000			*PCR 2*	*wcr18*	Deploy McLane pump (end 4 hours) *PCR5*
0100					
0200			*wcr8*	*wcr19*	*wcr29*
0300					
0400			*wcr9*	*wcr20*	*wcr30*
0500					
0600			S2C1 Cast *wcr10*	S3C1 Cast *wcr21*	S4C1 Cast *wcr31*
0700	Loading				
0800			Deploy IPS/SID *wcr11*	Deploy Sed trap *PCR4*	Deploy McLane pump (end 4 hrs) *wcr32*
0900					
1000			*wcr12*	*wcr22*	*wcr33*
1100					
1200	Depart Snug	Arrive at Stn	Hyperpro *wcr13*	Hyperpro *wcr23*	Hyperpro *wcr34*
1300		S1C1 Cast	S2C2 Core Cast	S3C2 Core Cast	S4C2 Core Cast
1400		*wcr3*	*wcr14*	*wcr24*	*wcr35*
1500		Deploy ESP			
1600		*wcr4*	*PCR3*	*wcr25*	*PCR6*
1700					
1800		*wcr5*	*wcr15*	*wcr26*	
1900		S1C2 Cast	Recover gas array	S3C3 Cast	S4C3
2000		Deploy gas array *wcr6*	*wcr16*	*wcr27*	Deploy gas array
2100			Deploy PP array	Recover PP array	
2200		*wcr7*	*wcr17*	*wcr28*	
2300					

Sept 6th: Sunrise: 0616, Sunset: 1844

'PCR' and 'wcr' refer to time of ESP samples which are remotely operated

Ship: R/V *KILO MOANA* KM11-26 Date: Sept6-21, 2011

TIME	Sun. 9/11	Mon. 9/12	Tues. 9/13	Wed. 9/14	Thurs. 9/15
0000	Deploy McLane pump (end 4 hours)	*PCR8*	Deploy McLane pump (end 4 hours)	*PCR11*	
0100					
0200					S9C1
0300					
0400					
0500					Deploy PP array
0600	S5C1 Cast	S6C1 Cast	S7C1 Cast	S8C1 Cast	S9C2
0700					
0800	Deploy McLane pump (end 4 hrs) *PCR7*		Deploy McLane pump (end 4 hrs) *PCR10*	Deploy ISP/SID	Deploy McLane pump (end 4 hours) *PCR13*
0900					
1000					
1100					
1200	Hyperpro	Hyperpro	Hyperpro	Hyperpro	Hyperpro
1300	S5C2 Core Cast	S6C2 Core Cast	S7C2 Core Cast	S8C2 Core Cast	S9C3 Core Cast
1400					
1500					
1600		*PCR9*		*PCR12*	
1700					
1800		Recover ISP/SID			
1900	S5C3 Cast		S7C3 Cast	S8C3	S9C4
2000	Recover gas array	S6C3		Deploy gas array	Recover gas array
2100					
2200				Deploy McLane pump (end 4 hours)	
2300					

Sept 11th: Sunrise: 0617, Sunset: 1839

Ship: R/V *KILO MOANA* KM11-26 Date: Sept6-21, 2011

TIME	Fri. 9/16	Sat. 9/17	Suns. 9/18	Mon. 9/19	Tues. 9/20
0000	*PCR14*	Deploy McLane pump (end 4 hours)		Deploy McLane pump (end 4 hours)	
0100					
0200					
0300					
0400					
0500	Recover PP array				
0600	S10C1	S11C1	S12C1	Recover ISP/SID	
0700					
0800		Deploy McLane pump (end 4 hours)	Recover ESP	Deploy McLane pump (end 4 hours)	
0900					
1000					
1100					
1200	Hyperpro	Hyperpro	Hyperpro		Transit Snug
1300	S10C2 Core Cast	S11C2 Core Cast	S12C2 Core Cast		
1400					
1500					
1600	*PCR15*				
1700					
1800	Recover sed trap				
1900		S11C3	S12C3		
2000	S10C3	Deploy gas array	Recover gas array		
2100					
2200					
2300					

Sept 16th: Sunrise: 0619, Sunset: 1834

Ship: R/V *KILO MOANA* KM11-25 CTD CASTS Date: Sept 6-21, 2011

Day	Cast	Max. depth	Samples	#Bottles
Sept 7	s1c1	500 m	ESP: LO (2@25), PA (2@25), DdV (2@25), DB (6@25)	12
	s1c2	500 m	ESP/Gas array: LO (12@25), DB (2@5, 25, 45, 75,100,125)	24
Sept 8	s2c1	500 m	ESP: LO (2@25), SW (2@25), PA (2@25), DB (6@25)	12
	S2c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S2c3	500 m	PP array DdV (12@TBD), SW (2@25)	14
Sept 9	s3c1	500 m	ESP: LO (2@25), SW (16@25), PA (2@25)	20
	S3c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S3c3	500 m	SW (2@25)	2
Sept 10	s4c1	500 m	ESP: LO (2@25) Nitrification cast: 1@(100,110,120,125, 130,135, 140, 145,150,155,160,175,180,185, 190, 195,200)	24
	S4c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S4c3	500 m	Gas array DdV (12@25), DB (2@5, 25, 45, 75,100,125)	24
Sept 11	s5c1	500 m	LO (11@25), DB (2@5, 25, 45, 75,100,125), PA (1@25)	24
	S5c2	1000 m	core (3@5,25,45,75,100,125,150,175)	24
	S5c3	500 m	SW (2@25)	2
Sept 12	s6c1	500 m	ESP: JR (2@25), SW (16@25), PA (2@25), DdV (3@25)	23
	S6c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S6c3	500 m	JR/KT (11@25), SW (2@25)	13

PA=Peter Alpert, **LO**=Liz Ottesen, **SW**=Sam Wilson, **JR=**Julie Robidart, **DB=**Deniz Bombar, **JB=**Jesse Bryant, **DdV=**Daniela del Valle, **KT=**Kendra Turk, **KC=**Karen Casciotti

Ship: R/V *KILO MOANA* **KM11-25 CTD CASTS** **Date: Sept 6-21, 2011**

Day	Cast	Max. depth	Samples	#Bottles
Sept 13	s7c1	500 m	JR/KT (11@25), SW (2@25), PA (2@25)	15
	S7c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S7c3	500 m	SW (2@25)	2
Sept 14	s8c1	500 m	ESP: JR (2@25), SW (16@25), DB (6@25)	24
	S8c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S8c3	500 m	Gas array: DB (2@5, 25, 45, 75,100, 125)	12
Sept 15	s9c1	500 m	Nitrification cast: 1@(100,110,120,125, 130,135, 140, 145,150,155,160,175,180,185, 190, 195,200)	24
	s9c2	500 m	ESP: JR (2@25), PA (2@25)	4
	S9c3	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	S9c4	500 m	SW (2@25)	2
Sept 16	s10c1	500 m	JR/KT (11@25), SW (2@25), PA (2@25)	15
	s10c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	s10c3	500 m	SW (2@25)	2
Sept 17	s11c1	500 m	ESP: JR (2@25), SW (16@25), PA (2@25)	20
	s11c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	s11c3	500 m	DB/KT (2@5,25,45,75,100,125) Gas array: DB (2@5, 25, 45, 75,100,125)	24
Sept 18	s12c1	500 m	ESP: JR (2@25), PA (2@25)	4
	s12c2	1000 m	core (3@5,25,45,75,100,125,150, 175)	24
	s12c3	500 m	DB/KT (2@5,25,45,75,100,125), SW (2@25)	14

LO=Liz Ottesen, **SW**=Sam Wilson, **JR**=Julie Robidart, **DB**=Deniz Bombar, **JB**=Jesse Bryant, **DdV**=Daniela del Valle, **KT**=Kendra Turk, **KC**=Karen Casciotti

Core cast (conducted daily)

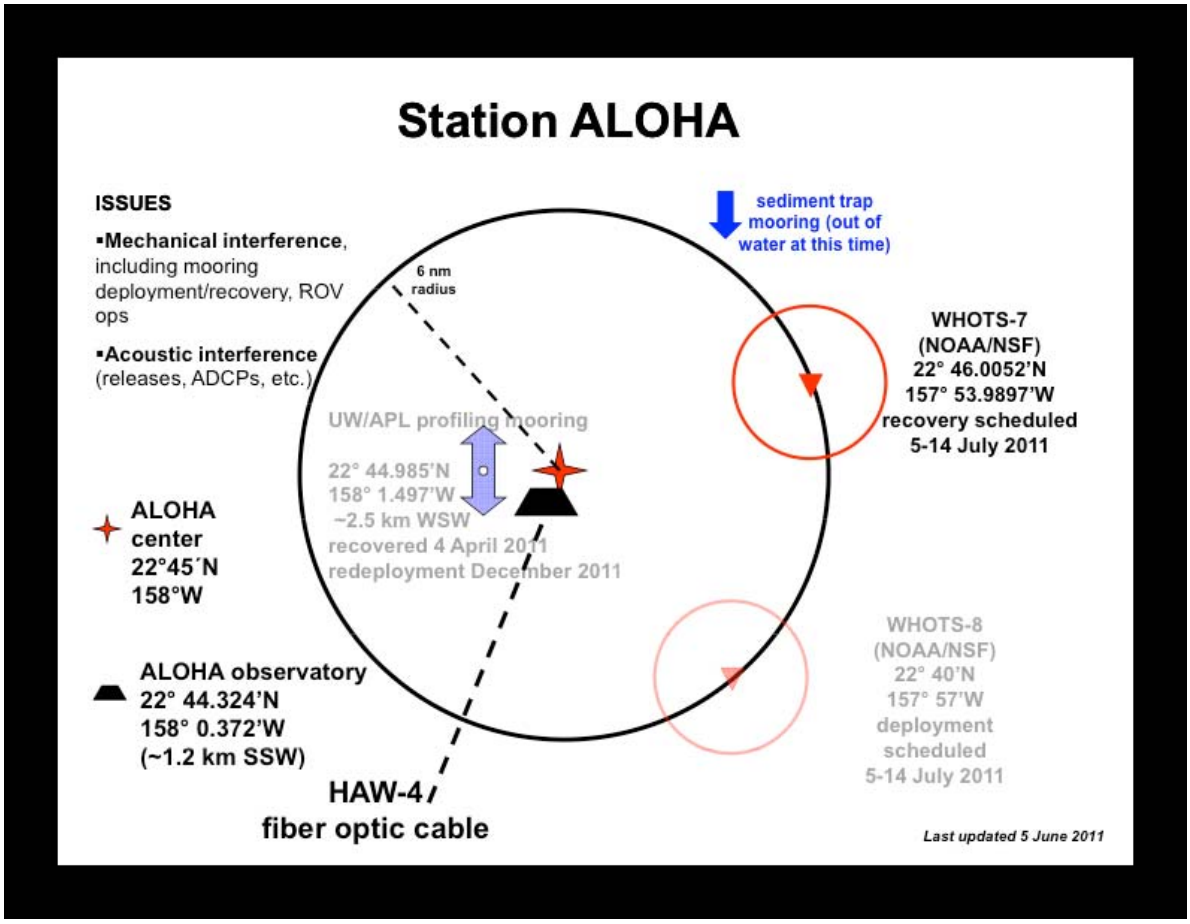
Measurement		Volume	Depths	Person
Particulates	PC/PN	4 L	5,25,45,75,100, 125, 150, 175	TC
	PPO4	4 L		TC
	Psi	4 L		TC
Nutrients	LLN/LLP	250 ml		TC
	NO2 + NO3, PO4, Si	750 ml		TC
Gases	O2	500 ml		TC
	H2	1 L		SW
	N2O and CH4	1 L		SW
Carbon	D13C DIC	500 ml		SL
	D13C DOC	500 ml		SL
	DIC/TA	500 ml		TC
Pigments	Chla – fluorometry	200 ml		TC
Cell counts	FCM	50 ml		KD
Genetics	DNA/RNA	4.5 L		KT
Isolation	Cells	250 ml		JW

(TC=Tara Clemente, SW=Sam Wilson, SL=Sara Lincoln, KD=Ken Doggett, KT= Kendra Turk, JW=John Waterbury)

Nitrification cast
(to be conducted 3 x during the cruise to identify the primary nitrite maxima and associated biogeochemical parameters)

Measurement		Volume	Depths	Person
Nutrients	LLN/LLP	250 ml	100,110,120, 125, 130,135, 140,145,150, 155,160,165, 170,175,200 250,300,400, 500	TC
	NO2 + NO3, PO4, Si	750 ml		TC
Gases	O2	500 ml		TC
	N2O and CH4	1 L		SW
Carbon	D13C DIC	500 ml		SL
	D13C DOC	500 ml		SL
Pigments	Chla – fluorometry	500 ml		TC
Cell counts	FCM	50 ml		KD
Genetics	DNA/RNA	4.5 L		KT
Isolation	Cells	250 ml		JW

(TC=Tara Clemente, SW=Sam Wilson, SL=Sara Lincoln, KD=Ken Doggett, KT= Kendra Turk, JW=John Waterbury)


Station ALOHA
ISSUES
▪Mechanical interference, including mooring deployment/recovery, ROV ops
▪Acoustic interference (releases, ADCPs, etc.)
sediment trap mooring (out of water at this time)
6 nm radius
WHOTS-7 (NOAA/NSF) 22° 46.0052'N 157° 53.9897'W recovery scheduled 5-14 July 2011
UW/APL profiling mooring
22° 44.985'N 158° 1.497'W ~2.5 km WSW recovered 4 April 2011 redeployment December 2011
ALOHA center 22°45´N 158°W
ALOHA observatory 22° 44.324'N 158° 0.372'W (~1.2 km SSW)
WHOTS-8 (NOAA/NSF) 22° 40'N 157° 57'W deployment scheduled 5-14 July 2011
HAW-4 fiber optic cable
Last updated 5 June 2011